

REFERENCE 1



Idaho National Engineering Laboratory

FAH-01-90

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Phone : 6-4542/MS2202
Date : January 8, 1990
Subject: Radiological Residues at the CFSGF Ash Pit as of December 31, 1989

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- Ref: 1) F.A. Hohorst, letter FAH-20-85, to G.J. McManus, "Interim Report on Radiological Residues from the CFSGF", dated October 21, 1985.
- 2) F.A. Hohorst, letter FAH-06-86, to G.J. McManus, "Second Interim Report on Radiological Residues at the CFSGF", dated March 3, 1986.
- 3) F.A. Hohorst, letter FAH-15-86, to B.G. Motes, "Radiological Residues at the CFSGF Ash Pit as of September 30, 1986, dated October 20, 1986.
- 4) F.A. Hohorst, letter FAH-06-87, to B.G. Motes, "Radiological Residues at the CFSGF Ash Pit as of September 30, 1987, dated October 12, 1987.
- 5) F.A. Hohorst, letter FAH-09-88, to B.G. Motes, "Radiological Residues at the CFSGF Ash Pit as of September 30, 1988, dated November 2, 1988.

This letter represents an update of the radiological residues inventory at the Coal Fired Steam Generation Facility (CFSGF) ash pit as of December 31, 1989. The CFSGF is a complex southeast of the main ICPP security fence which consists of a 750 by 450 foot enclosure containing several buildings, the principal one being CPP-687. The current ash disposal pit has no facility identification number. It is a 400 by 620 foot area due east of this complex, centered at site coordinates N693292/E298210.

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The inventory of radioactivity in residues at the CFSGF ash pit has been the subject of five prior letters (References 1-5). Reference 1 made a preliminary estimate of the inventory in the residues based on typical concentrations. Reference 2 reported the actual inventories based on results of analyses of samples taken from the CFSGF and included specific estimates from the data through FY-85. Gamma analyses of samples were reported in Reference 3. Normal concentrations of uranium-235 (0.72% of total uranium) and its progeny were assumed. These data were used in computing the quantities of the radioisotopes potassium-40, thorium-232, and uranium-238 reported in subsequent tables. Reference 3, 4 and 5 summarized data and reported estimates for FY-86, FY-87 and FY-88, respectively.

This letter reports usage and generation from October 1, 1988, to December 31, 1989, accumulations to date, gamma analyses of current feed materials, and gamma analyses of ash taken from the ash pit on July 19, 1989.

Coal consumption during the period was 17679 tons (1.604×10^7 kg). The supplier for the coal was the same supplier as in FY-88, the U.S. Coal Co., Hiawatha Mine, Price, UT. Limestone consumption was 4571 tons (4.147×10^6 kg). The supplier of limestone was Bighorn Calcium Co, Billings, MT.

Dumping at the ash pit east of the CFSGF continued, adding a calculated 5809 tons (5.269×10^6 kg) of ash (i.e., limestone residues plus 7.0% coal ash) to the pit during the period. Figure 1 was prepared from an EG&G Idaho high altitude photograph taken on May 4, 1989, at 1031 from an altitude of 15720 ft. It documents physical changes at the ash pit since the previous photograph on May 11, 1988. As can be seen, part of the west side of the pit has been further covered with earth as an interim seal. Dumping is proceeding from points further east because trucks can now drive over the interim seal. Water added to the ash to suppress dust drains into the eastern part of the pit. Several patches of discarded concrete about 2 meters in diameter by 0.5 meter thick were also observed.

Table 1 summarizes the use of coal and limestone, and inventory of ash, for the period and their cumulative quantities to date. The total calculated volume of ash in the CFSGF ash pit is 41,300 cubic meters (54,000 cubic yards) as of December 31, 1989. This represents an increase of 7400 cubic meters (9700 cubic yards) since October 1, 1988.

Using these data and data in Reference 2 and 3, Tables 2 and 3 were prepared reporting the changes during the year for thorium-232 and uranium-238, respectively. The calculated increase in these radioisotopes was 18 kilograms of thorium-232 and 28 kilograms of uranium-238. Assuming a natural isotopic abundance of uranium-235, its increase was 0.20 kg.

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Table 4 summarizes the changes to the inventories of radioisotopes for FY-88 and the quantities to date. The total estimated quantity of radioisotopes in the CFSGF ash pit was 0.67 curie as of December 31, 1989. This represents an increase of 0.16 curie since October 1, 1988. These estimates assume secular equilibrium in the thorium-232, uranium-235, and uranium-238 decay chains.

Table 5 reports the locations and masses of samples removed from the ash pit on July 19, 1989, between 0930 and 1100. Locations are reported using site co-ordinates; the pattern chosen was equidistant points approximately 40 yards apart in the uncapped portion of the pit. I estimate the uncertainty in these locations at ± 2 yards. A 1-inch aluminum hand auger was used. Sampling depth varied from 4 to 8 inches (10 to 20 cm) depending on local density. The variation in sample size reflects in part the differences in moisture content among the samples.

Table 6 reports the results of gamma analyses of samples collected this year. The purpose of these analyses was to illustrate the degree of uniformity in feed materials from the same source. A further purpose was to collect and analyze several samples before the ash pit is completely filled. Collection now is far easier than drilling to sample after the ash pit is completely filled. Counting geometry was as previously reported in Reference 2. These samples will be sealed and archived until further notice. Agreement with prior analysis appears reasonable; see Table 1 in Reference 2.

In summation, the ICPP ash pit is a 255,000 square foot, surface impoundment Solid Waste Management Unit (SWMU) which receives nonhazardous waste, primarily ash resulting from operation of the CFSGF. This SWMU received a calculated total of 5808 tons of solid waste between October 1, 1988, and December 31, 1989. The remaining capacity of this SWMU is 49,300 cubic yards. This SWMU has received a calculated total of 27,400 tons of solid waste since it was first placed in service in 1984.

If you have any questions, please call me.



Frederick A. Hohorst
Effluent & Environmental Analysis

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TABLE 2

Mass Increase of Thorium-232 at CFSGF

October 1, 1988, to December 31, 1989

	<u>Consumed</u> <u>(g)</u>	<u>Assay</u> <u>(Ci g-1)</u>	<u>Activity</u> <u>(Ci)</u>
Coal:			
Hiawatha	1.604×10^{10}	1.2×10^{-13}	1.9×10^{-3}
Limestone:			
Bighorn Calcium	4.147×10^9	1.9×10^{-14}	7.9×10^{-5}
<hr/> TOTAL <hr/>			
Thorium-232 Calculated - 2.0×10^{-3} Ci			
Thorium-232 Calculated - 18 kg			

TABLE 3

Mass Increase of Uranium-238 at CFSGF

October 1, 1988, to December 31, 1989

	<u>Consumed</u> <u>(g)</u>	<u>Assay</u> <u>(Ci g⁻¹)</u>	<u>Activity</u> <u>(Ci)</u>
Coal:			
Hiawatha	1.604×10^{10}	4.4×10^{-13}	7.1×10^{-3}
Limestone:			
Bighorn Calcium	4.147×10^9	5.1×10^{-13}	2.1×10^{-3}
<u>TOTAL</u>			
Uranium-238 Calculated - 9.2×10^{-3} Ci			
Uranium-238 Calculated - 28 kg			

TABLE 1

Coal and Limestone Use, and Ash Generated
October 1, 1988, to December 31, 1989

<u>Item</u>	<u>Units</u>	<u>FY-88</u>	<u>Cumulative On 12/31/88</u>
Coal	kilograms	16,040,000	77,610,000 ^a
Limestone	kilograms	4,147,000	19,460,000 ^a
Ash ^b	kilograms	5,269,000	24,890,000 ^a
Ash ^b	cubic meters	7,400	41,300

^aRecords of purchases are incomplete prior to FY-85.

^b"Ash" as used here refers to limestone plus 7.0% coal ash.

TABLE 4

Radioisotope Inventory at the CFSGF Ash Pit

October 1, 1988, to December 31, 1989

<u>Radioisotopes</u>	<u>Units</u>	<u>FY-88</u>	<u>Cumulative On 12/31/89</u>
Potassium-40	Ci	<0.0001	<0.001
Thorium-232 & Progeny	Ci	0.022	0.10
Uranium-235 & Progeny	Ci	0.0051	0.021
Uranium-238 & Progeny	Ci	0.13	0.55
TOTAL	Ci	0.16	0.67

TABLE 6

Radioisotope Concentrations in 1989 CFSGF Samples

Sample	Mass (g)	Radionuclides (± 1 sigma)		
		Potassium-40 (pCi g ⁻¹)	Thorium-232 ^a (pCi g ⁻¹)	Uranium-238 ^b (pCi g ⁻¹)
Ash Composite ^c	513	2.8 (18)	1.5 (26)	1.6 (15)
Coal, Elevator	767	0.56 (28)	0.62 (11)	0.30 (27)
Coal, Stockpile ^d	767	0.43 (28)	0.80 (9)	0.55 (13)
Limestone	1730	0.86 (11)	0.050 (36)	0.20 (15)

^aCalculated from a weighted average of the thorium-232 progeny based upon the square of the error.

^bNo weighted average was computed because of the variable (40-60%) loss of radon-222 from the substrate.

^cSampled at locations specified in Table 5.

TABLE 5
Locations Sampled for Ash at CFSGF
July 19, 1989

<u>Sample Number</u>	<u>Site Co-ordinates</u>		<u>Mass (g)</u>
	<u>North</u>	<u>East</u>	
1	N693140	E298410	57.25
2	N693260	E298410	31.37
3	N693380	E298410	42.29
4	N693440	E298310	54.18
5	N693320	E298310	34.28
6	N693200	E298310	43.69
7	N693140	E298210	57.41
8	N693260	E298210	53.80
9	N693380	E298210	75.69
10	N693440	E298110	63.18
TOTAL			513.14

FIGURE 1

CFSGF Including the Ash Pit from 15720 ft
(From EG&G Photograph 89-279- 1- 1, May 4, 1989, @ 1031)

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